Electronic Version
Stylesheet Version v1.1.1

Description

External apparatus for feeding-liquid temperature conditioning for washing machines

Cross Reference to Related Applications

[0001] U.S. Pat. No. 6,327,730; U.S. Pat. No. 4,525,709; U.S. Pat. No. 5,299,340

Background of Invention

[0002] Field of the invention:

[0003] The most energy in household washing machines such as cloth- or dish- washing machines, depending on the chosen program, is used to heat the water or the detergent solution, respectively. The heating of the water is accomplished usually by means of an electric heater. Electric energy might become more expensive and the availability of warm water-supply from alternative energy sources is likely to increase in the future. This invention is about an apparatus to deliver pre-warmed water as feeding water

for a washing machine in order to minimise the demand for electrical heating within the washing machine. The pre-warmed water is obtained by mixing cold and hot water at a suitable ratio to provide the desired washing temperature. As hot water supply, water heated by solar energy or any other available source may be utilised. The apparatus shall be useable for any existing washing machine whereby no need to alter the existing machine shall arise. By feeding the machine with pre-warmed water the internal thermostat will simply not switch on the internal heater or switch it on for a reduced period of time if the desired washing temperature is not reached by the pre-warmed water.

[0004] Discussion of the prior art:

[0005] Most washing machines use a feed for cold water only. The water usually mixed with some detergent is heated then until a thermostat, present at a certain temperature switches of the heater. This pre-set temperature of course depends on the chosen washing program. This method is practical and economical regarding production costs. But from the point of view of energy consumption and efficiency to use electricity for heating may not be the most economic way. Several proposals to use hot and cold wa-

ter to achieve the desired liquid temperature in washing machines have been made. For example, U.S. Pat. No. 4,525,709 proposes a system where both temperature and flow rate of cold and hot water are separately sensed. Using this information and the desired overall liquid temperature and amount, the right amounts of cold and hot water are calculated and admitted into the tub. U.S. Pat. No. 6,327,730 describes an adjustable liquid temperature system where in a washing machine the desired liquid temperature is achieved by fixed pre-programmed but adjustable mixing ratios of the in-flowing cold and hot water. In this way the need for temperature sensors is removed.

[0006] A system with fault tolerance is introduced by U.S. Pat. No. 5,299,340. Here mainly two washing modes are considered, one for wool and one boiling wash mode. Two water feeds are checked if the required water pressure and temperature for either the wool or the boiling mode is available. Depending on the mode selection of the user one of the water feeds is activated. If the selected mode cannot be executed with the available water supplies without harm for the clothes an alarm is indicated.

[0007] All these proposals deal with washing machines where

cold and hot water flow control mechanisms are incorporated to lead to an improved washing machine which accepts hot and cold water to reduce the consumption of electricity. The control of the water feeds usually is part of the control of the washing machine. Most commercially available household washing machines however do only have one water supply.

[0008] The present invention is about an apparatus external to the washing machine which may be used with existing washing machines.

SUMMARY OF INVENTION

[0009] The invented apparatus is an adapter which is connected to the standard water inlet of a washing machine. The purpose of the apparatus is to supply pre-warmed water to the washing machine instead of cold water, depending on the water temperature requirements for the actual washing mode. The typical apparatus will usually have water inlets for cold and for hot water. A mixing unit within the apparatus establishes the proper mixing ratio between the cold and the hot water to deliver water of the desired temperature depending on the setting made by the user.

[0010] This mixing ratio may be determined then by the user-

setting either in a direct way or in an indirect way by setting the temperature. Furthermore a timer mechanism can be incorporated to disable the hot water supply after a certain period of time to prevent the waste of hot water for later stages of the washing operation, e.g. for flushing-modes where only cold water is required.

Brief Description of Drawings

[0011] Figure 1: Shows the placement of a mixing apparatus connected to the water inlet of the washing machine with cold and hot water supplies.

[0012] Figure 2: Shows a possible embodiment of the mixing apparatus with temperature dial, switch to enable or to disable the hot water supply, or to select the timer controlled hot water supply and a dial to set the timer.

[0013] Figure 3: Shows the principle of a mechanical mixing unit with 3 different settings.

Detailed Description

[0014] In a preferred embodiment the mixing apparatus is realised substantially without electronics and "high-tech" components. The adjustment of the mixing-ratio of the in-flowing cold and hot liquid is accomplished by a principle where valves are connected and moved mechanically.

One possible realisation of this principle is depicted in Fig. 3a -3c. Here a lever can be moved between two limits. One limit corresponds to the setting where only the flow of cold liquid is enabled (Fig. 3a). The other limit permits the flow of hot liquid only (Fig. 3c). All the settings between these limits correspond to certain mixing-ratios of cold and hot liquid. Fig. 3b shows one such setting. Of course other mechanical solutions with valves are thinkable too. A certain mixing-ratio of cold and hot liquid however does not guarantee a certain temperature of the resulting out-flowing liquid since it also depends on the temperature and the pressure of the cold and hot in-flowing liquids. For a certain location these conditions may not vary very much, the pressure, for example could be stabilised by pressure limiters. The most significant variation in the conditions of the in-flowing liquids may exits most likely in the temperature of the hot liquid, especially if water, heated by solar energy is used.

[0015] To set the mixing-ratio a lever or knob is moved, in accordance with this movement a pointer moves along a scale (Fig. 3a). The scale can carry the values of the corresponding mixing-ratios or temperature values of the desired temperature of the out-flowing liquid.

[0016] Such a temperature-scale preferably takes into account the conditions of the in-flowing liquids. Different scales, adjusted to a certain set of conditions, may be employed. These scales may be printed onto inserts which can be replaced by the user. A number of such insets can be prepared for a variety of conditions. In addition empty describable inserts may allow the user to make her own marks for different washing modes under certain conditions.

[0017] To monitor the temperature of the out-flowing liquid a thermometer may be incorporated in the flow of the combined liquids. A further thermometer may also be used to check the temperature of the in-flowing hot liquid and perhaps another to check the temperature of the in-flowing cold liquid too.

[0018] Most washing machines, in later states of the washing program, use cold water to flush the laundry or the dishes. To use pre-warmed water here also, would in many cases be a waste of energy. Because of that a timing mechanism may be introduced. This timer may be started with the beginning of the washing operation and set for a certain period of time. This period of time may be set by the user and determines after which time, measured from

the activation, the supply of hot water is reduced or inhibited. The period of time is preferably set to a duration sufficient to supply the washing operation when pre-warmed water is required, but should preferably also be short enough that substantially no hot water is wasted for the flushing. A simple realisation may consists of, but is not limited to, a spring-loaded valve that is triggered with an "egg-clock"-type of timer. When the timer expires the spring-loaded valve is triggered and then closed in this way. In addition a switch can be incorporated which enables or disables the hot water supply or selects the timer controlled hot water supply. A possible arrangement of these controls on the apparatus is depicted in Fig. 2.

[0019] Alternatively in a more comfortable embodiment of the invention, differing temperatures of the in-flowing liquids may be taken into account and be compensated automatically. Such a mechanism can, for example, be realised by a negative feedback of the resulting temperature to a valve that controls the flow of the in-flowing hot liquid. Such a feedback could also adjust the mixing ratio. Mechanically such mechanism can be implemented, for example, by the use of bimetallic elements acting as a sensor and an actuator simultaneously. The control mechanism can also be

realised by electronics employing electromechanical actuators and appropriate sensors.

[0020] Additionally, an interface may be introduced which allows the control of the apparatus externally, for example, by the washing machine. In this way the mixing ratio may be controlled or also the timing of the flow of the different liquids.